INSTRUCTION MANUAL

MODEL 13116-2
X-Y DISPLAY

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SERIAL 102

INSTRUCTION MANUAL

MODEL 13116-2
X-Y DISPLAY

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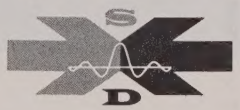

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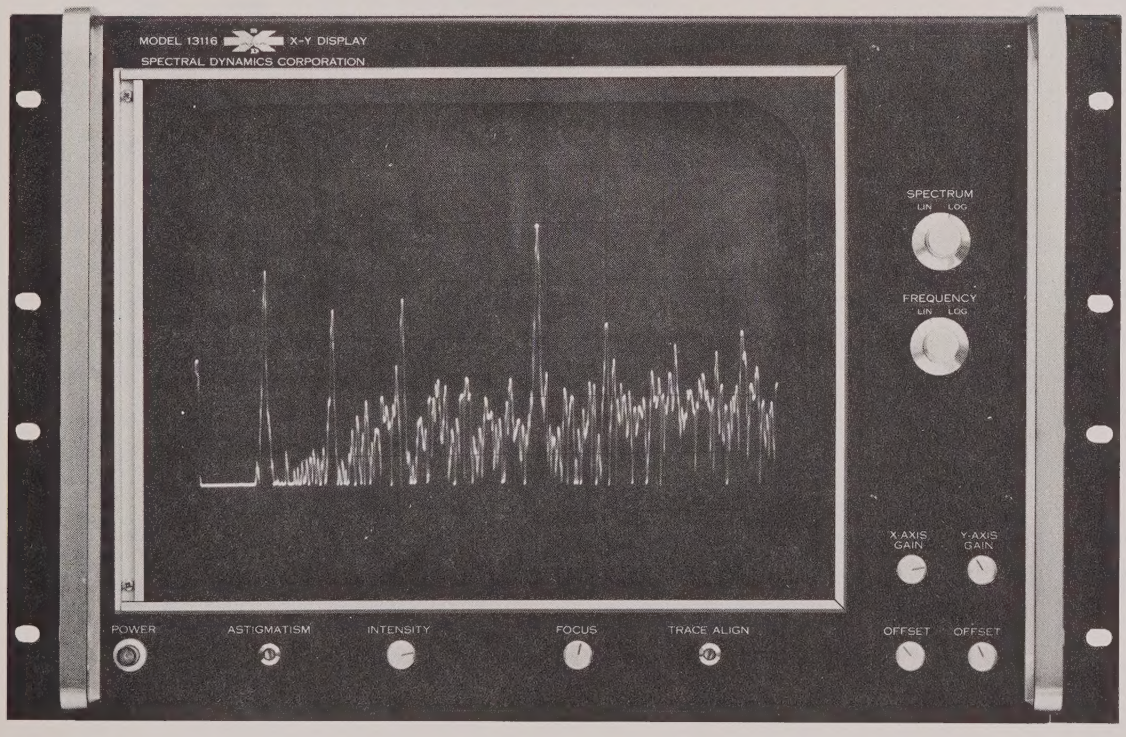

MODEL 13116-2 X-Y DISPLAY

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PREFACE

RECEIVING INSPECTION PROCEDURE

The Model 13116-2 Display unit is shipped fully assembled, packed in a polystyrene case designed to protect it against all normal shipping hazards. Immediately upon receipt, inspect the exterior of the shipping case and note any visible damage. Keep all forms and invoices attached to the shipping case. Remove the instrument from the shipping case and test its functional operation in accordance with Section II of this manual. If shipping damage is apparent, file a claim with the carrier's claims agent and send a copy to Spectral Dynamics Corporation. Be sure to include the instrument name, model number, and serial number on all correspondence. Spectral Dynamics Corporation will advise the buyer what should be done; arrangements for repair or replacement will be made as applicable.

WARRANTY POLICY

All Spectral Dynamics products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain components listed in some of the operating manuals, for the specified period. We will repair or replace products which prove to be defective during the warranty period, providing the failure or damage has not been caused by misuse or abnormal operating conditions. Fuses and lamps are specifically excluded from warranty. If the malfunction or a portion thereof is determined by Spectral Dynamics Corporation to have been caused by misuse or abnormal conditions of operation, an estimate of cost to repair will be submitted to the purchaser for approval before beginning any repair work.

Liability under this warranty is limited to servicing and adjusting the instrument returned to the factory, with transportation charges prepaid by the purchaser. No other warranty is expressed or implied. We are not liable for consequential damages.

If any malfunction develops, notify Spectral Dynamics Corporation or its representative in your area, giving details of the problem, and the name, model and serial number of the equipment. Upon receipt of this information, service data or shipping instructions will be provided.

RETURN SHIPMENT PROCEDURE

On receipt of shipping instructions, forward the instrument prepaid via air freight to the factory or authorized repair station indicated on the instructions. Replace the instrument in its original shipping case, or surround with two to three inches of shock absorbing material and then pack it in a heavy-weight cardboard box, wooden box, or other strong container.

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Model 13116-2 X-Y Display unit provides a visual display of an input spectrum. The X-Y spectrum information is supplied by the Model SD301 series of Real Time Analyzers. (The Model 13116-2 was designed specifically to operate with this unit; it has no internal sweep generating circuits.)

The spectrum is displayed on an 8-inch (vertical) by 10-inch (horizontal) display CRT; an 8-inch by 10-inch graticule over the scope face is divided into 1-inch squares, with subdivisions of 0.2 inch along the major axes. All controls used for adjusting the size, quality and position of the display are located on the front panel. (Refer to Paragraph 1.3 in this manual.) BNC connectors on the rear of the chassis accept interconnection cables from the Model SD301 RTA. (Refer to Paragraph 1.4.)

1.2 CONCEPT OF OPERATION (See Figure 1-1.)

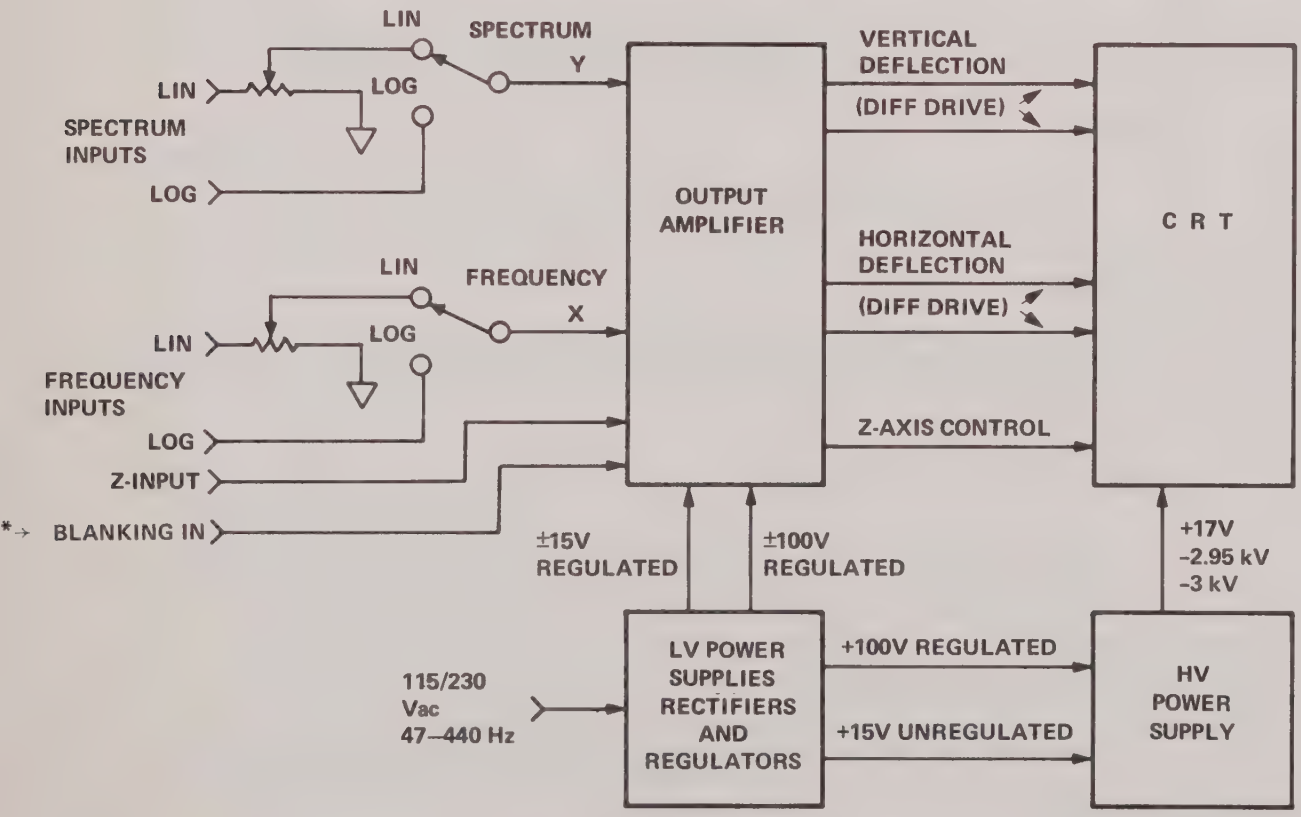


Figure 1-1. Simplified Block Diagram – Model 13116-2 X-Y Display

*Revised (4-3-72)

The Model 13116-2 employs a wide-band large screen oscilloscope consisting of low and high voltage power supplies, and X and Y deflection amplifiers. The selected LIN or LOG inputs are fed to the X and Y output amplifiers. Because the SD301 LIN OUTPUTS are 5V full scale, and the LOG OUTPUTS are 1V full scale, adjustable voltage dividers are included in each LIN INPUT circuit preceding the LIN/LOG selector switches. The X and Y output amplifiers accept the single-ended X and Y signals and provide differential drive to the CRT horizontal and vertical deflection plates.

The LV (low voltage) power supply provides regulated d-c operating voltages to all the amplifier circuits and to the HV (high voltage) power supply. The high voltages for the CRT are generated by an oscillator-type power supply operating at approximately 20 kHz. Multiple windings on the HV transformer provide the −3 kV and −2.95 kV supplies, and ≈4.25 kV which is quadrupled to provide the +17 kV post accelerator voltage for the CRT.

1.3 FRONT PANEL FUNCTIONAL DESCRIPTION

The following paragraphs provide a brief description of each of the front panel functions.

POWER Push Button Switch/Indicator

Press to turn X-Y Display unit power on or off; lighted when power is on.

INTENSITY Control

Adjusts the brightness of the display; turn clockwise for brighter display.

FOCUS Control

Focuses the trace lines for displaying sharpest details. (Refer also to the ASTIGMATISM control.)

*ASTIGMATISM Screwdriver Adjust

Adjusts the roundness of a single spot display; used with the FOCUS control to achieve the best display.

*TRACE ALIGN Screwdriver Adjust

Aligns the horizontal trace lines so they are parallel to the horizontal graticule lines.

*Adjustments normally used only during calibration.

*X-AXIS GAIN and OFFSET Screwdriver Adjustments

GAIN varies the gain of the X amplifier; provides 2.5:1 range of adjustment (from 0.1V/inch to 0.25V/inch).

OFFSET (below X-AXIS GAIN) positions display lines horizontally.

*Y-AXIS GAIN and OFFSET Screwdriver Adjustments

GAIN varies the gain of the Y amplifier; provides 2.5:1 range of adjustment (from 0.1V/inch to 0.25V/inch).

OFFSET (below Y-AXIS GAIN) positions display lines vertically.

X-Y Display Scope

The scope graticule is 8 inches vertical by 10 inches horizontal, divided into 1-inch squares with 0.2-inch subdivision marks on the major axes.

SPECTRUM LIN/LOG Selector

Selects the SPECTRUM LIN or LOG INPUT from the SD301 for application to the Y-axis deflection amplifier. A variable voltage divider circuit is connected in series with the LIN INPUT circuit to normalize the 5V full scale LIN signal to the 1V full scale LOG signal from the SD301. (The potentiometer is mounted internally on the back of the SPECTRUM LIN/LOG selector.)

FREQUENCY LIN/LOG Selector

Selects the FREQUENCY LIN or LOG INPUT from the SD301 for application to the X-axis (sweep) deflection amplifier. A variable voltage divider circuit is connected in series with the LIN INPUT circuit to normalize the 5V full scale LIN signal to the 1V full scale LOG signal from the SD301. (The potentiometer is mounted internally on the back of the FREQUENCY LIN/LOG selector.)

*Adjustments normally used only during calibration.

1.4 REAR-OF-CHASSIS FUNCTIONAL DESCRIPTION

The following paragraphs provide a brief description of each of the input/output functions.

X-INPUT: LIN (J9), LOG (J10)

Accept the FREQUENCY LIN and LOG OUTPUTS from the SD301 for selection and then application to the X-axis deflection amplifier.

Y-INPUT: LIN (J11), LOG (J12)

Accept the SPECTRUM LIN and LOG OUTPUTS from the SD301 for selection and then application to the Y-axis deflection amplifier.

Z-INPUT

Accepts +1V input for full intensity, -1V input for blanking.

*→ BLANKING IN (J13)

Accepts zero voltage signal or open circuit for normal CRT intensity or +5 volts for retrace blanking.

115/230 Switch

Allows changeover of primary power input circuit for either 115V or 230V operation. Proper input voltage to be applied shows in window.

FUSE

Contains 3AG type, SLO-BLO fuse; 3A for 115V or 1.5A for 230V operation.

POWER IN

Accepts 3-wire plug and cable (supplied) for applying 115/230 Vac 50—400 Hz primary input power. Center terminal is chassis ground. Uses Belden No. 17258-S cable.

1.5 SPECIFICATIONS

INPUTS . . . . . Spectrum Lin and Log, Frequency Lin and Log } From SD301

Z-input: +1V for full intensity
-1V for blanking

*

Blanking Input: 0V for normal intensity
+5V for blanking

*Revised (4-3-72)

SETTLING TIME . . . . . Less than 7 μs to within a trace width of final value.

REPEATABILITY . . . . . Less than 0.15% error for re-addressing a point from any direction.

LINEARITY . . . . . ±1% of full screen over 8 x 10-inch screen; any inch with respect to any other inch, within 10%.

CATHODE RAY TUBE

Accelerating Potential . . . . . 20 kilovolts

Writing Rate . . . . . Greater than 20 inches per μs

Spot Size . . . . . Less than 30 mils throughout 8 x 10-inch screen at 100 foot-lamberts light output; nominally 20 mils at center screen (shrinking raster).

Phosphor and Graticule . . . . . Aluminized P1 phosphor with 8 x 10-inch graticule.

CONTROLS, FRONT PANEL . . . . . Push button POWER on-off switch; screwdriver adjust ASTIGMATISM, TRACE ALIGN, X-AXIS GAIN and OFFSET, and Y-AXIS GAIN and OFFSET; control knobs for INTENSITY and FOCUS; rotary switches for SPECTRUM LIN/LOG and FREQUENCY LIN/LOG selection.

SYSTEM OPERATION . . . . . The Model 13116-2 was designed to operate with Model SD301 series of Real Time Analyzers

COOLING . . . . . The Model 13116-2 does not contain a fan; therefore, if it is installed in a confined area such as a rack containing other equipment, external cooling is recommended and may be required.

POWER . . . . . 105–125/210–250 Vac (switch selectable); 50 to 400 Hz; approximately 175 watts.

DIMENSIONS	Height	31,12 cm (12-1/4")
	Width	42,55 cm (16-3/4")*
	Depth	47 cm (18-1/2")
	Shipping Weight	29,03 kg (64 lbs)

*Rack-mount hardware supplied for std. 19-inch rack mounting.

SECTION II

OPERATION

2.1 GENERAL

The Model 13116-2 was designed to operate specifically with the Model SD301 series of Real Time Analyzers. Refer to Paragraphs 1.3 and 1.4 in Section I of this manual for a functional description of all front-panel controls and indicators, and rear-chassis connectors.

2.2 INITIAL POWERING

CAUTION

Before applying primary power to the instrument, be sure that the 115/230 switch on the rear of the chassis is set properly, and that the correct fuse is installed in the fuse holder.

a. Connect the power cord to the primary power source.

b. Press the POWER push button on the front-panel; it should light to indicate power is applied.

c. Allow at least a 10-minute warmup before operating the instrument.

2.3 OPERATION

* a. Interconnect the Model 13116-2 and SD301 RTA units using five coaxial cables (with BNC fittings on both ends). Connect the LOG and LIN X and Y INPUTS on the Model 13116-2 to the FREQUENCY and SPECTRUM OUTPUTS on the rear chassis of the SD301. Connect the RETRACE BLANKING signal from the RTA unit to BLANKING IN (J13) on the Model 13116-2.

b. Apply power to both units and allow at least a 10-minute warmup.

c. On Model 13116-2 front panel, set both the FREQUENCY and SPECTRUM selectors to LIN.

d. Place SD301 in CAL mode and provide a full-scale SPECTRUM signal to the Model 13116-2.

e. On Model 13116-2, adjust Y-AXIS GAIN and OFFSET controls for the desired amplitude display on the CRT.

f. Adjust SD301 to supply internal frequency markers.

g. On Model 13116-2, adjust X-AXIS GAIN and OFFSET controls so that the horizontal sweep is contained within the graticule pattern.

h. If necessary, adjust TRACE ALIGN so that the X-axis sweep base-line is parallel to the horizontal graticule lines.

i. Adjust ASTIGMATISM, INTENSITY, and FOCUS as necessary for the best display.

j. To check LOG signals, set SPECTRUM selector to LOG; observe that the relative amplitudes are the same as for the LIN signal input. Set the FREQUENCY selector to LOG, and observe a log sweep presentation on the CRT.

SECTION III

THEORY OF OPERATION

3.1 GENERAL

The Model 13116-2 X-Y Display unit provides a visual display of an input spectrum. For a simplified description of its operation, refer to Paragraph 1.2, Concept of Operation, in Section I of this manual. Review also the functional operation of the front-panel controls and indicators given in Paragraph 1.3.

3.2 FUNCTIONAL BLOCK DIAGRAM DESCRIPTION (See Figure 3-1.)

3.2.1 X-Y INPUT Switching

In the normal SD301/13116-2 system configuration, both the FREQUENCY LOG and LIN outputs and the SPECTRUM LOG and LIN outputs from the SD301 are connected to the associated X and Y INPUT connectors on the rear of the 13116-2 chassis. In this condition, the front-panel FREQUENCY and SPECTRUM switches provide operator selection of the desired input for display. Because the SD301 LIN outputs are 5V full scale and the LOG outputs are 1V full scale, variable voltage divider circuits are included for input normalization. The potentiometers are adjusted at the factory to provide the proper 5:1 ratio for use with the SD301 series RTA.

3.2.2 Output Amplifier (See Figure 3-1.)

The output amplifier contains two identical amplifier channels, each with associated GAIN and OFFSET controls, which provide the X-axis and Y-axis deflection signals for the CRT. These amplifiers accept the single-ended X and Y input signals and provide differential outputs for driving the CRT horizontal and vertical deflection plates. The Z-axis output amplifier is single-ended; its output is applied to the CRT grid to control the intensity of the display.

3.2.3 Low Voltage Power Supply (See Figure 3-2.)

The low voltage power supplies provide regulated +100V, -100V, +15V, and -15V for the operation of all circuits in the Model 13116-2. The +100V regulated and a +15V unregulated output are used to power the circuits of the High voltage power supply described in Paragraph 3.2.4. The regulated +100V is further reduced (and regulated) to provide +46.4V for the CRT accelerator electrode.

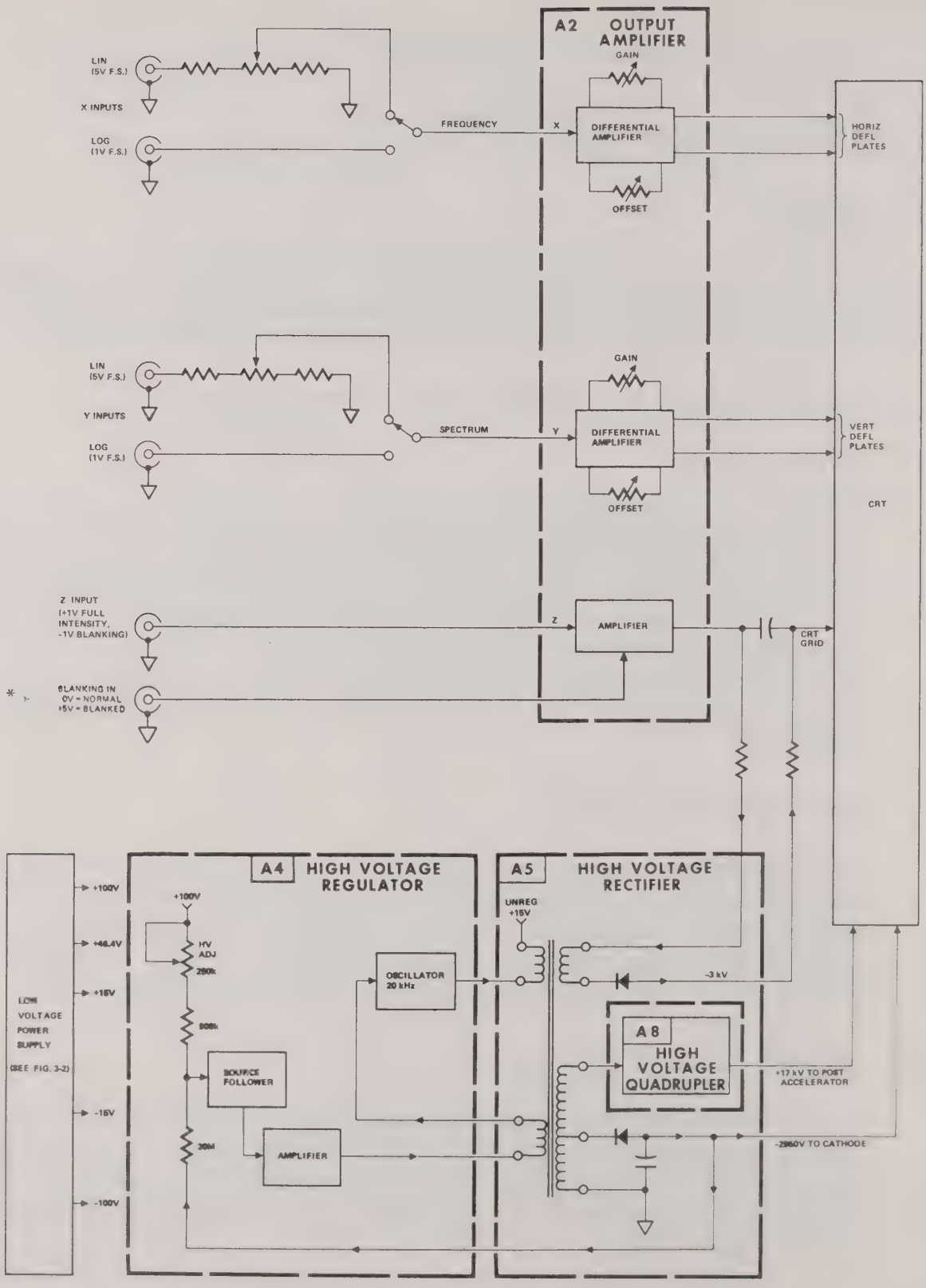


Figure 3-1. Functional Block Diagram — Model 13116-2 X-Y Display

*Revised (4-3-72)

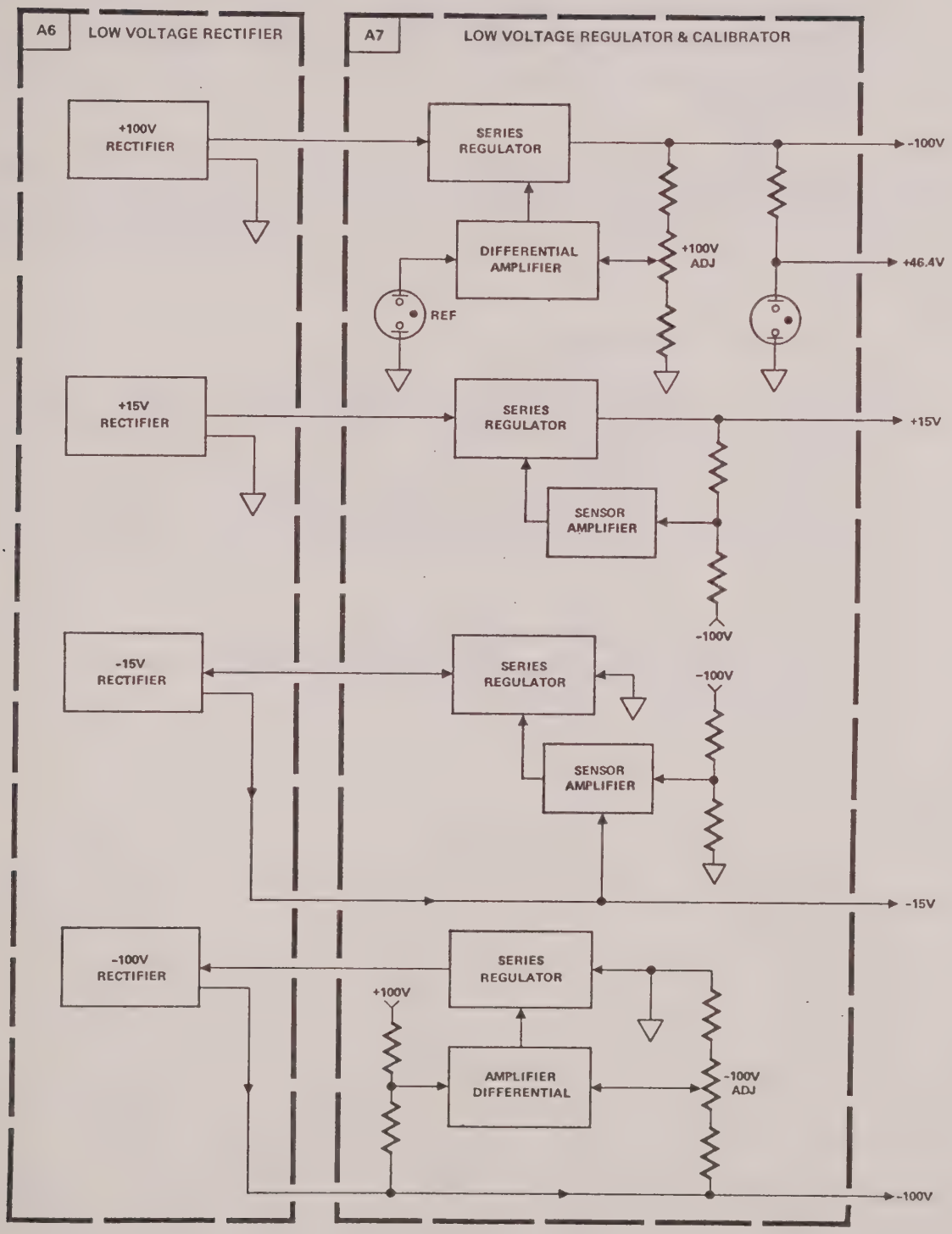


Figure 3-2. Functional Block Diagram — Low Voltage Power Supply

The 115/230V, 50–400 Hz a-c input power is fused and filtered, and routed through the front-panel POWER push button switch to power transformer 1T1. The rear-chassis 115/230 slide switch facilitates connecting the primary windings of 1T1 in parallel for 115V operation or in series for 230V operation. The multiple secondary windings of 1T1 supply the full-wave bridge type rectifier circuits.

Conventional solid-state diode rectifiers and electronic voltage regulators are used to provide all d-c operating voltages. The +100V supply is referenced to a glow tube. The -100V supply is referenced to the output of the +100V supply. Both the -15V and +15V supplies are referenced to the output of the -100V supply.

3.2.4 High Voltage Supply (See Figure 3-1.)

The high voltage supply comprises the high voltage regulator and rectifier boards and the quadrupler. This supply generates the -2.95 kV, -3 kV, and +17 kV for the CRT. The -2.95 kV is sensed by a 30:1 divider and the resultant voltage is referenced to the regulated +100V. Deviations from zero volts (at the divider junction) are amplified and applied to the oscillator. The oscillator produces a sine wave signal of approximately 20 kHz that drives the primary of the HV transformer.

The secondary voltages are diode rectified and filtered to produce a "floating" -3 kV grid supply and a -2.95 kV cathode supply. One winding supplies the quadrupler which produces the +17 kV post accelerator voltage.

SECTION IV

OPERATION

4.1 GENERAL

The following procedures are pertinent to the low voltage and high voltage power supplies; no other adjustments are required. Table 4-1 lists the test equipment required; test equipment having equal or better operating characteristics may be substituted.

NOTES

1) In general, calibration of this instrument should not be performed unless a definite problem exists and/or maintenance has required the replacement of components.

2) Correct operation of the high voltage power supply is dependent on the proper output voltages from the low voltage supply.

3) To perform the calibration, the instrument must be operative. If not, the problem must first be isolated and repaired before any section can be calibrated.

Table 4-1. Test Equipment Required.

Name	Model No.	Manufacturer
DC VTVM	410B	Hewlett-Packard
Voltage Divider (100:1)	11044A	Hewlett-Packard
Voltage Calibrator	738BR	Hewlett-Packard
Sweep Oscillator (Signal Generator)	SD104A	Spectral Dynamics
Monitor Oscilloscope	H-P180A w/1801A	Hewlett-Packard

4.2 CALIBRATION

4.2.1 Preliminary Setup

a. Place the Model 13116-2 on a test bench. (It need not be connected into a system configuration for this procedure.)

b. Set the front-panel controls as follows:

INTENSITY	10 o'clock
X-AXIS GAIN	Maximum Clockwise
Y-AXIS GAIN	Maximum Clockwise
X-AXIS OFFSET	Center of Travel
Y-AXIS OFFSET	Center of Travel

c. Apply power to the Model 13116-2 and all test equipment; allow a 15-minute warmup.

4.2.2 Low Voltage Power Supplies (See Figure 4-1.)

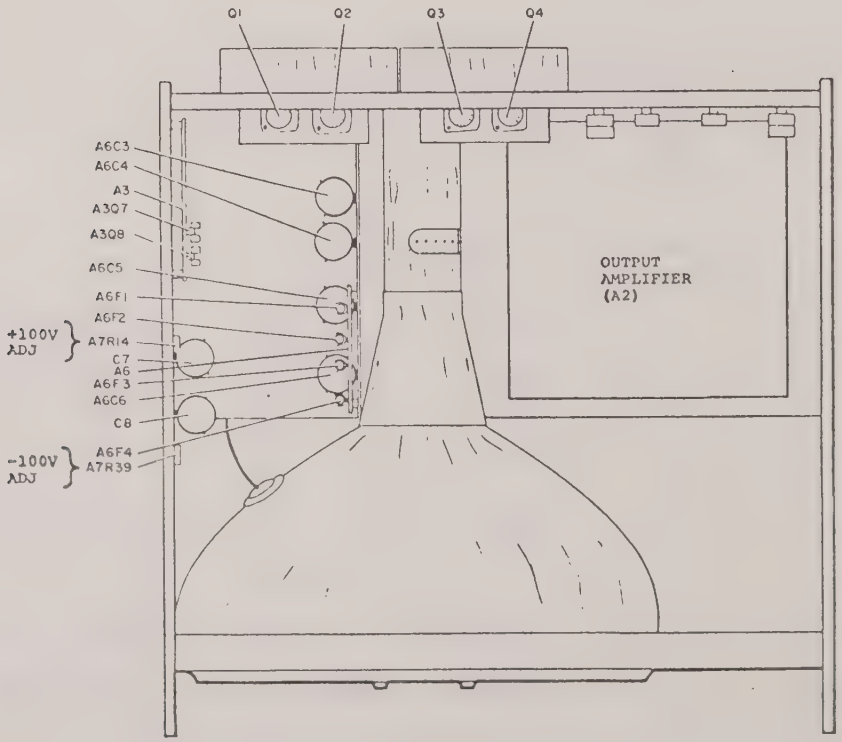


Figure 4-1. Chassis Top View — Low Voltage Adjustments

TROUBLESHOOTING ON EASY ST.

PROBLEMS

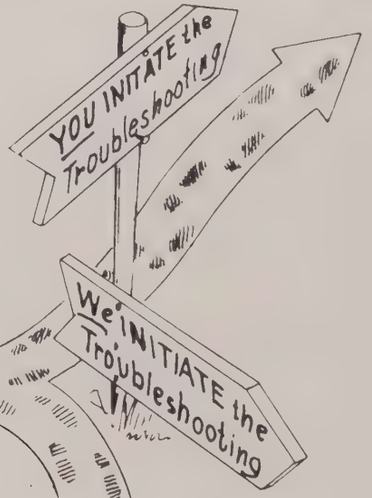
- Has not ever worked on instrument.
- No instrument manual.
- People breathing down your neck.
- Has not experienced the failure himself.

MENTAL THOUGHTS

- Problem is probably simple.
- I can fix this problem easily.
- I am going to think logically.
- I am going to carefully evaluate the front panel indications.
- I better talk rationally to the person that experienced the failure.

READY

- I can whip the problem "NOW."



SUCCESSIV

ONE HALF

ONE QUA

- Loo
- Eval rem
- Thi
- Do
- Use

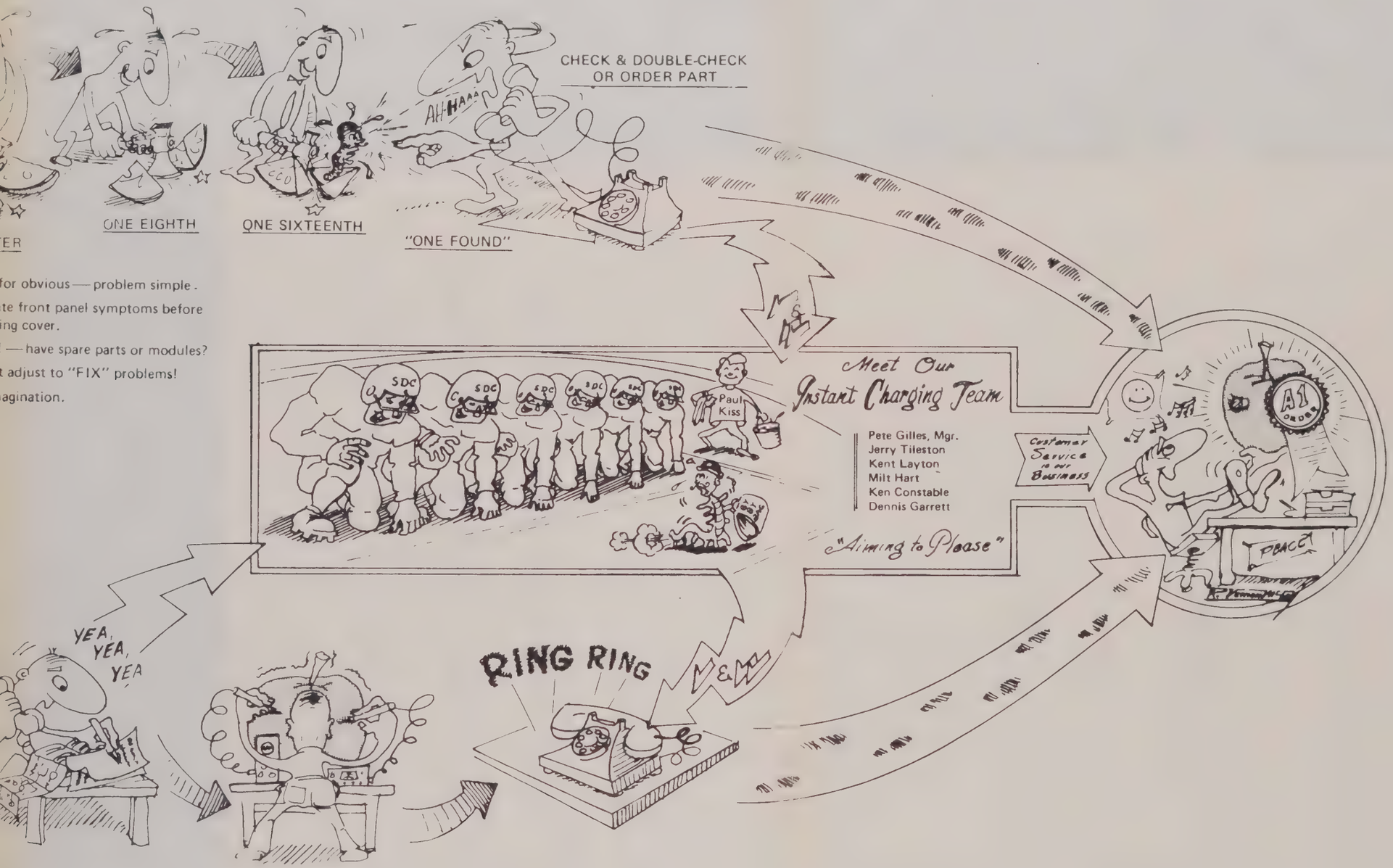
PREPARATION FOR CALL

- Read the manual.
- What Serial Number?
- Have talked to person experiencing failure.

YOU C

•

HALF-SPLIT TROUBLESHOOTING METHOD



ER

for obvious — problem simple.
te front panel symptoms before
ing cover.
— have spare parts or modules?
t adjust to "FIX" problems!
agination.

L FOR INSTRUCTIONS
/e spell out tests.

YOU PERFORM CHECKOUT
- As instructed

WE CALL BACK
- To check & Double-check.

TROUBLESHOOTING PHILOSOPHY FLOW CHART

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

a. Remove the instrument top cover.

b. Connect VTVM to A7TP1, the +100V test point on circuit card A7. Adjust A7R14 for +100V reading.

c. Connect VTVM to A7TP5, the −100V test point on circuit card A7. Adjust A7R39 for 100V reading.

d. Check the +15V supply at A7TP3 and the −15V supply at A7TP4. Both voltages should be within ±0.3V of the nominal ±15V.

e. Replace the top instrument cover.

4.2.3 High Voltage Power Supply (See Figure 4-2.)

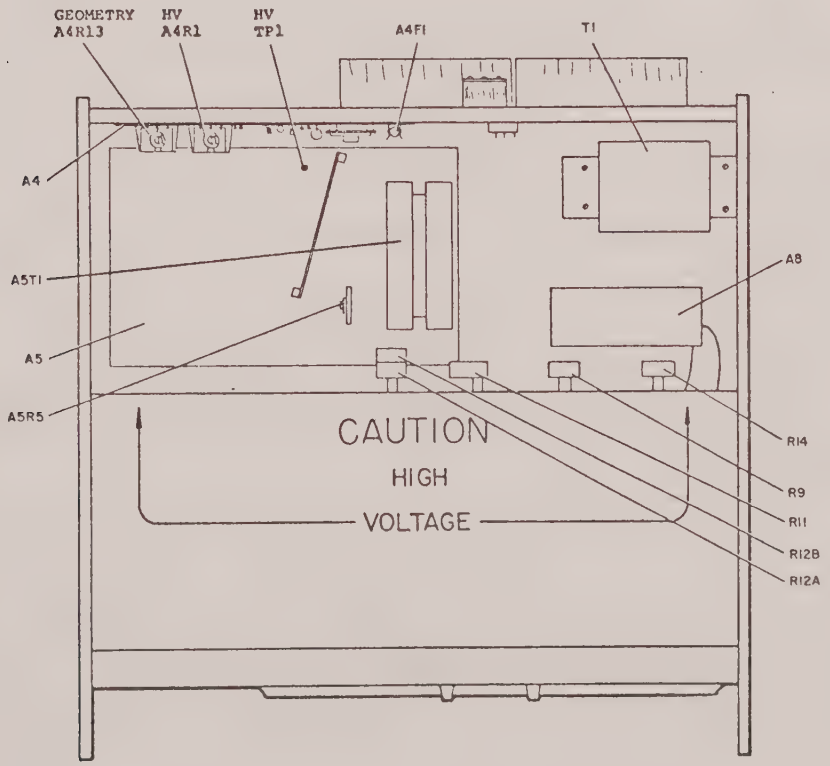


Figure 4-2. Chassis Bottom View — High Voltage Adjustments

WARNING

The voltages being measured in the high voltage supply are dangerous to life. To prevent transference of high voltage outside of the instrument, a 100:1 high voltage divider probe must be used on the end of the VTVM d-c probe.

NOTE

All voltage readings given in the following adjustment procedure assume the use of a 100:1 divider probe.

a. Rest instrument on its side and remove the bottom cover.

b. Connect the 100:1 divider probe to the d-c probe of the VTVM.

c. Set VTVM to the -3 Vdc range.

d. Set voltmeter calibrator to -300 Vdc output.

e. Touch divider tip to output of the calibrator and adjust the VTVM gain to give a VTVM reading of -3V.

f. Set VTVM to -30 Vdc range.

g. Observe WARNING and touch end of 100:1 divider probe to the HV test point on circuit card A5.

h. Adjust A4R1 (HIGH VOLTAGE ADJ) for -29.5V reading on VTVM.

i. Remove the divider probe from the HV test point; remove the divider probe from the end of the VTVM d-c probe; and recalibrate VTVM as necessary.

4.2.4 Intensity Limit Adjustment

No test equipment is required for this adjustment. However a focused spot must be visible on the CRT.

a. Adjust the front-panel INTENSITY control to 9 o'clock.

b. Observe WARNING on bottom of chassis, and on circuit card A5, adjust A5R5 (INTENSITY LIMIT) to just extinguish the spot.

4.2.5 Geometry Adjustment

(Two signal generators are required for this adjustment.)

a. On the Model 13116-2, set both front-panel FREQUENCY and SPECTRUM selectors to LOG position.

b. Connect the variable output of a signal generator to the LOG Y-INPUT; adjust for 50 kHz.

c. Connect the variable output of a second generator to the LOG X-INPUT; adjust for 10 kHz.

d. Adjust the output levels of the signal generators to obtain the largest, solid, square pattern possible without going outside the graticule edge lines.

e. Observe the shape of the raster on the Model 13116-2 CRT (also WARNING on bottom of chassis) and adjust A4R13 (GEOMETRY) to obtain the squarest display with the least distortion at the vertical and horizontal edges.

4.2.6 Display Normalization

To perform this procedure, the particular SD301 to be used in the system is required. This procedure is used to normalize the full-scale displays of the SPECTRUM LOG to the SPECTRUM LIN, and the FREQUENCY LOG to the FREQUENCY LIN.

a. Connect the SPECTRUM LIN/LOG and FREQUENCY LIN/LOG outputs of the SD301 to the Model 13116-2 inputs.

b. Place the SPECTRUM switch to LOG and the FREQUENCY switch to LOG.

c. Using the SD301 FREQ-CAL switch and the Model 13116-2 X-AXIS GAIN/OFFSET controls, display two decades of frequency.

d. Remove the Model 13116-2 top cover.

e. Place the SD301 FREQ-CAL switch to F.S. The dot should appear at full scale.

f. Place the Model 13116-2 FREQUENCY switch to LIN position. Adjust R4 (behind FREQUENCY switch) so that the dot appears at full scale. This completes the X-axis normalization.

g. Using the SD301 SPECTRUM-CAL switch and the Model 13116-2 Y-AXIS GAIN/ OFFSET controls, calibrate the Y-axis for 10 dB/inch.

h. Place the SD301 MODE switch to MAN position, the function switch to SPECTRUM-CAL 0-dB, and position the dot at full scale.

i. Place the Model 13116-2 SPECTRUM switch to LIN position. Adjust R1 (behind SPECTRUM switch) so that the dot appears at full scale. This completes the Y-axis normalization.

This completes the calibration procedure. Remove power and all test equipment, replace the bottom cover, and place the Model 13116-2 in service.

4.3 PARTS REPLACEMENT

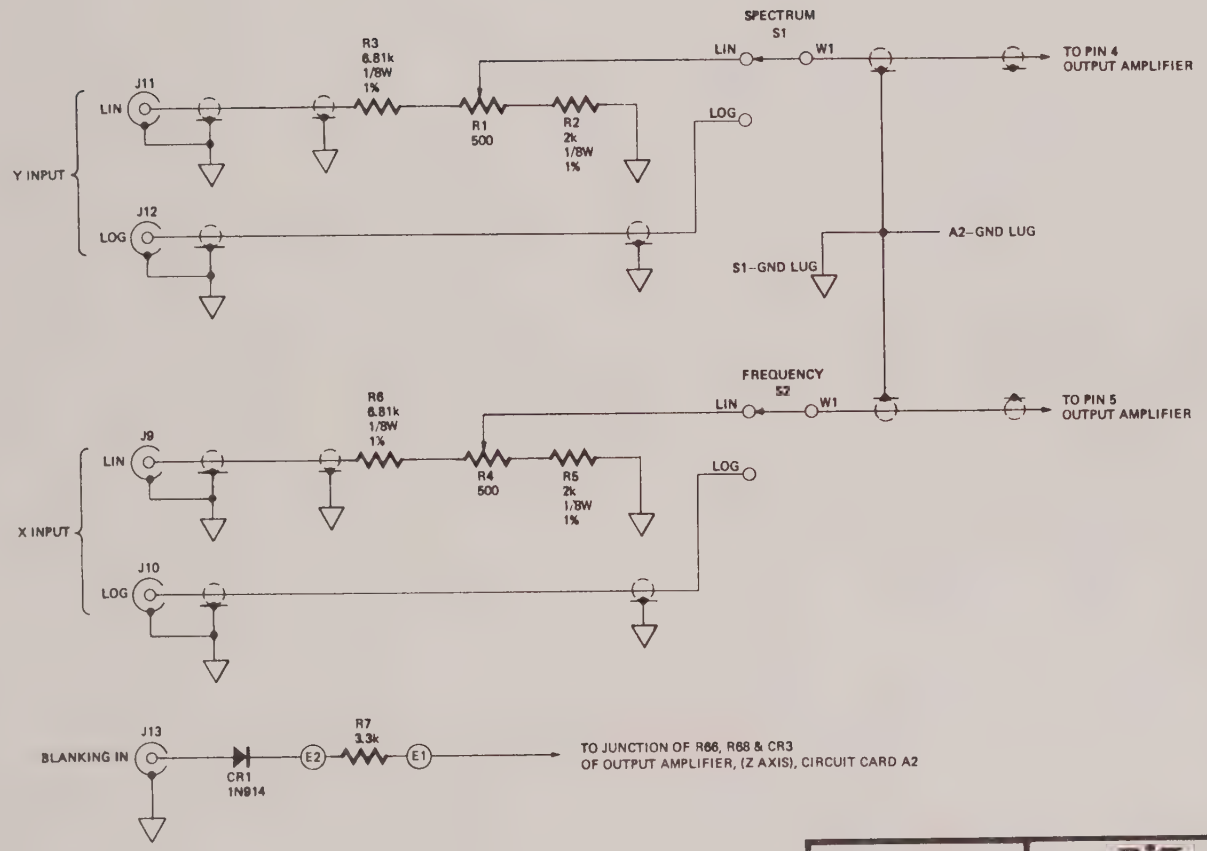
Except for some special SDC specification-controlled parts listed in Table 4-2, which must be ordered from Spectral Dynamics Corporation, standard electronic parts have been used throughout the instrument. Spectral Dynamics Corporation maintains a complete stock of the printed circuit card assemblies used in this instrument.

When ordering a replacement part or assembly, be sure to include the reference designator, the part number of manufacturer's designation, and a complete description; include also the instrument name, model number, and serial number.

Table 4-2. Special Replaceable Parts List

Reference Designator	Description	Part Number/ Mfr. Designation
A2	Circuit Card, Output Amplifier	01300-93145
A4	Circuit Card, HV Regulator	01300-66501
A5	Circuit Card, HV Supply	01300-66502
A6	Circuit Card, LV Rectifier	01300-66509
A7	Circuit Card, LV Regulator	01300-66510
V1	X-Y Display Tube	5083-1752
	Knob, SPECTRUM, FREQUENCY LIN/LOG	20013-175

REV	ECO	S/N	DESCRIPTION	DRAFT	CHECK	APP'D
A	—	011	REDRAWN	G.B.C. 6-71		
B	1062	031	R3 & R6 WERE 6.34k	G.B.C. 4-4-72		
C	1079	011	ADDED R7, CR1 & J13	G.B.C. 4-27-72		



NOTES UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
LINEAR XX ± 03 XXX ± 010
ANGULAR ± 0 30'
DO NOT SCALE DRAWING
MATERIAL
FINISH

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

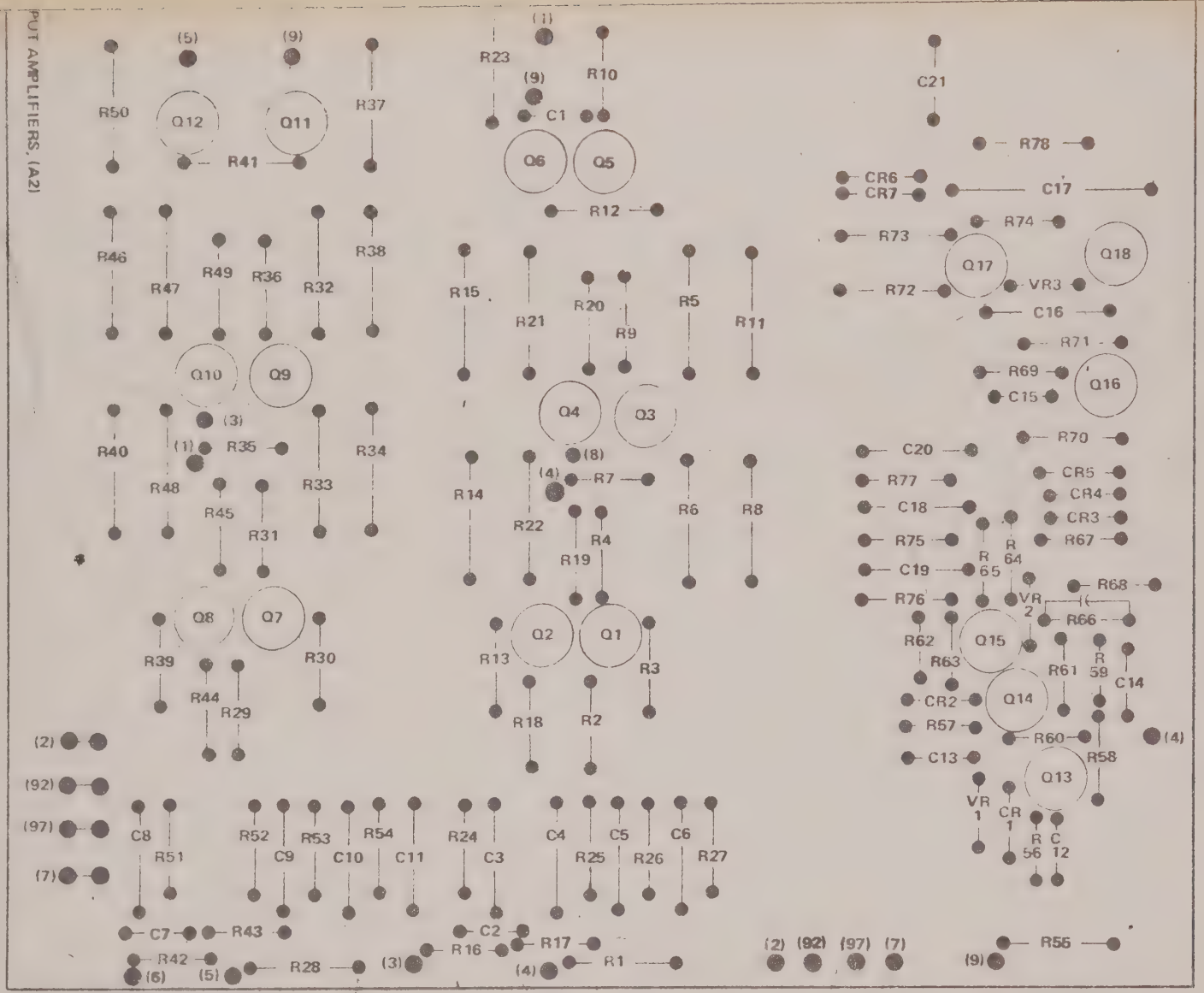
DRAWN	G. CLARE	8-1-71
DESIGNER		
CHECKED		
ENGINEER		
APPROVED		

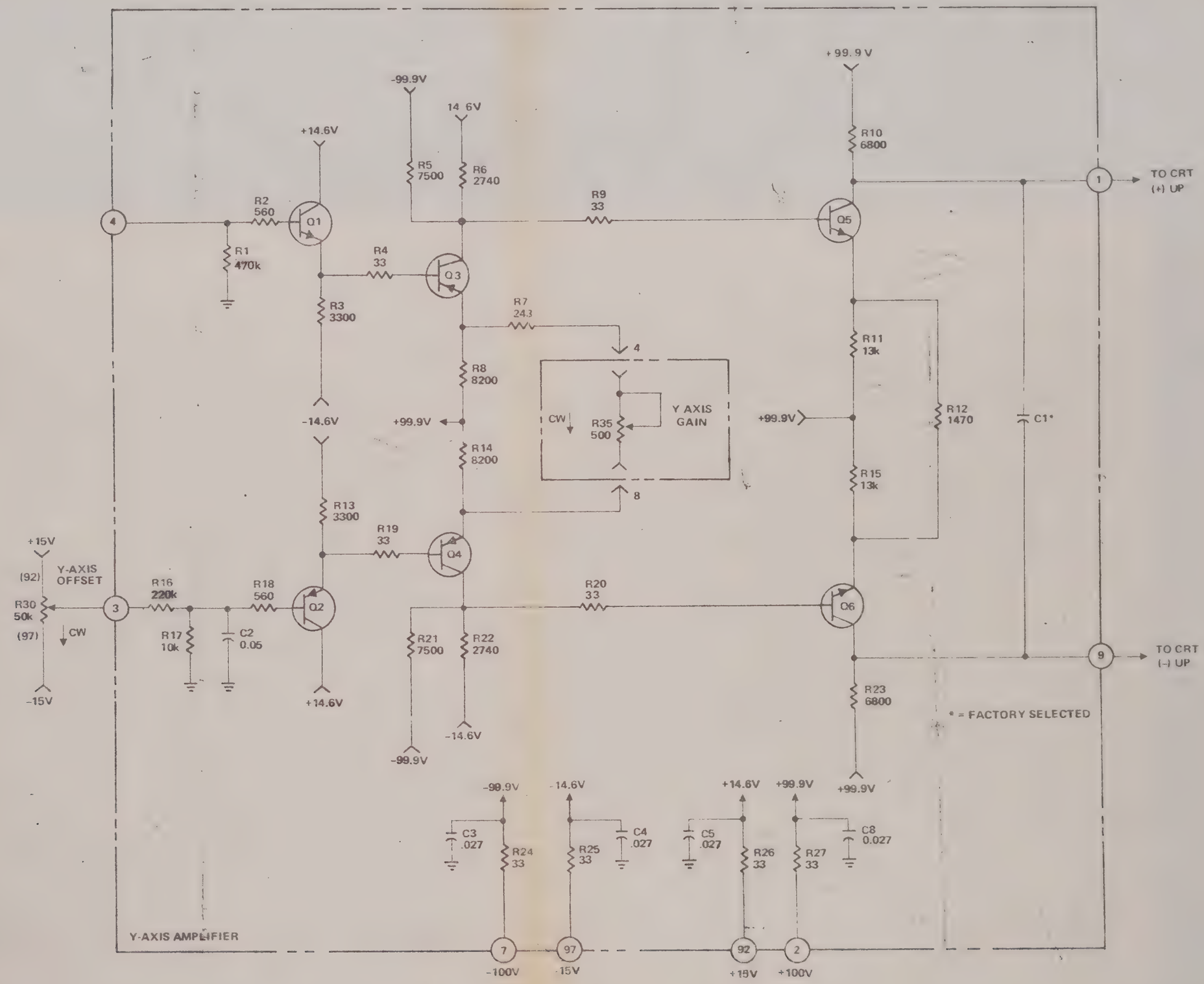
TITLE
X-Y INPUT INTERCONNECTION DIAGRAM

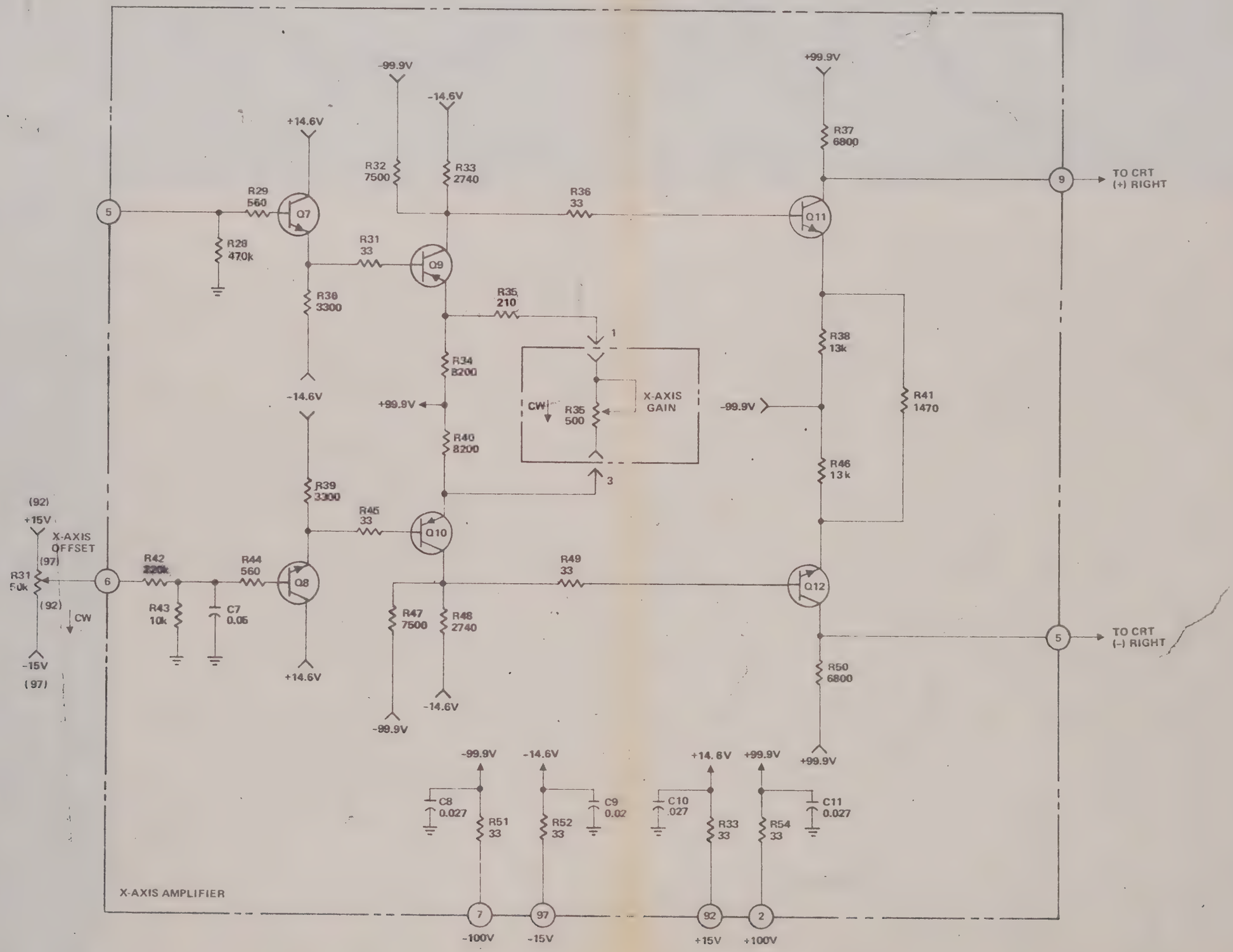
MODEL	SIZE	DRAWING NO.	REV
13116-2		13889	C

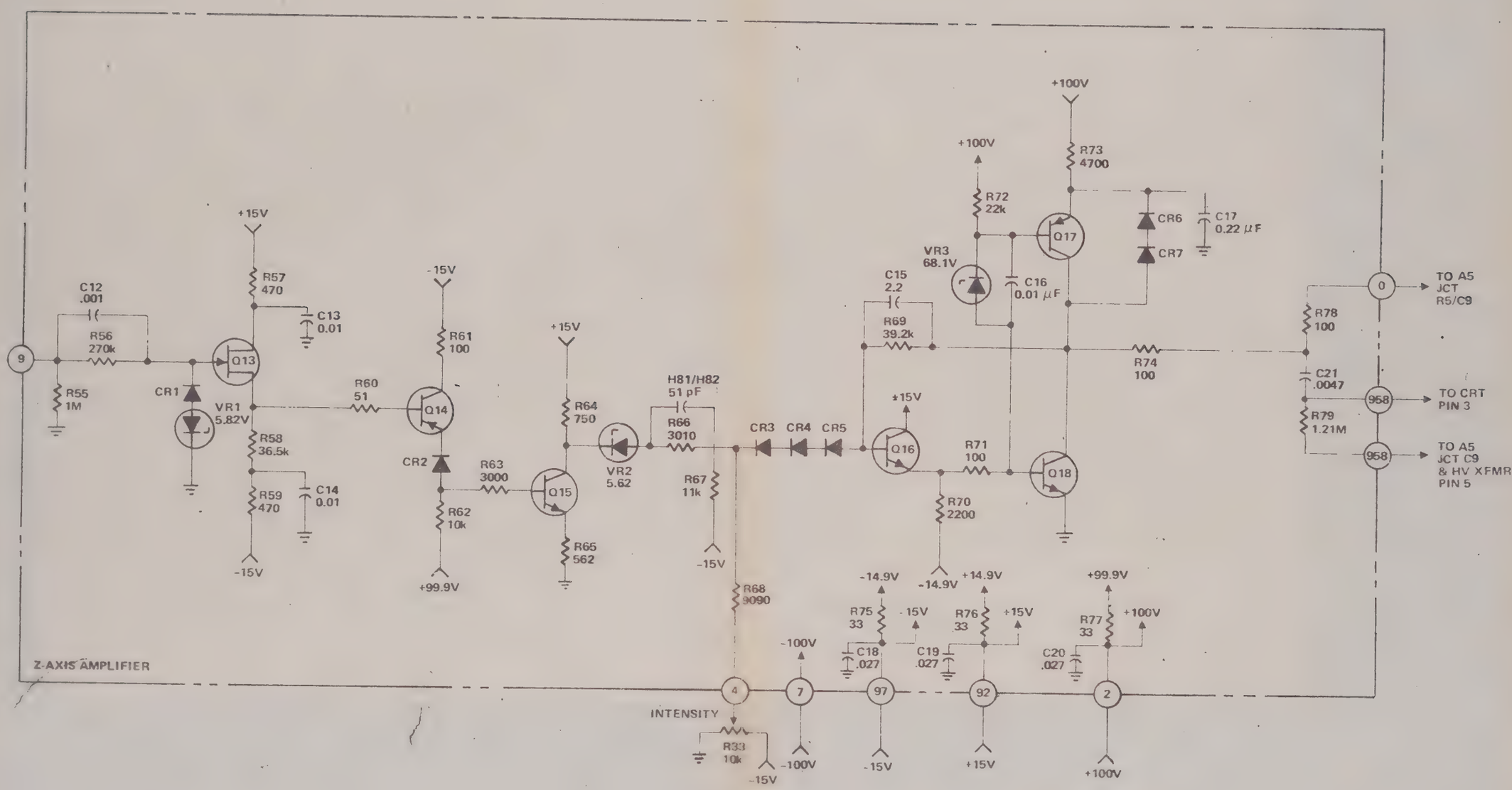
SCALE | SHEET 1 OF 1

PUT AMPLIFIERS, (A2)




+99.9V
-99.9V
14.6V
+14.6V
R10
6800
R5
7500
R6
2740
R9
33
TO CRT
(+) UP
R2
560
Q1
Q5
R1
470k
R4
33
Q3
R3
3300
R7
24.3
R11
13k
R8
8200
Y AXIS
GAIN
CW
R35
500
R12
1470
C1*
-14.6V
+99.9V
R14
8200
R15
13k
R13
3300
R19
33
Q4
+15V
(92)
Y-AXIS
OFFSET
R30
50k
(97)
CW
-15V
R16
220k
R18
560
Q2
R17
10k
C2
0.05
+14.6V
R20
33
Q6
R21
7500
R22
2740
-14.6V
-99.9V
R23
6800
TO CRT
(-) UP
* = FACTORY SELECTED
C3
.027
R24
33
R25
33
C4
.027
C5
.027
R26
33
R27
33
C8
0.027
-100V
-15V
+15V
+100V
Y-AXIS AMPLIFIER

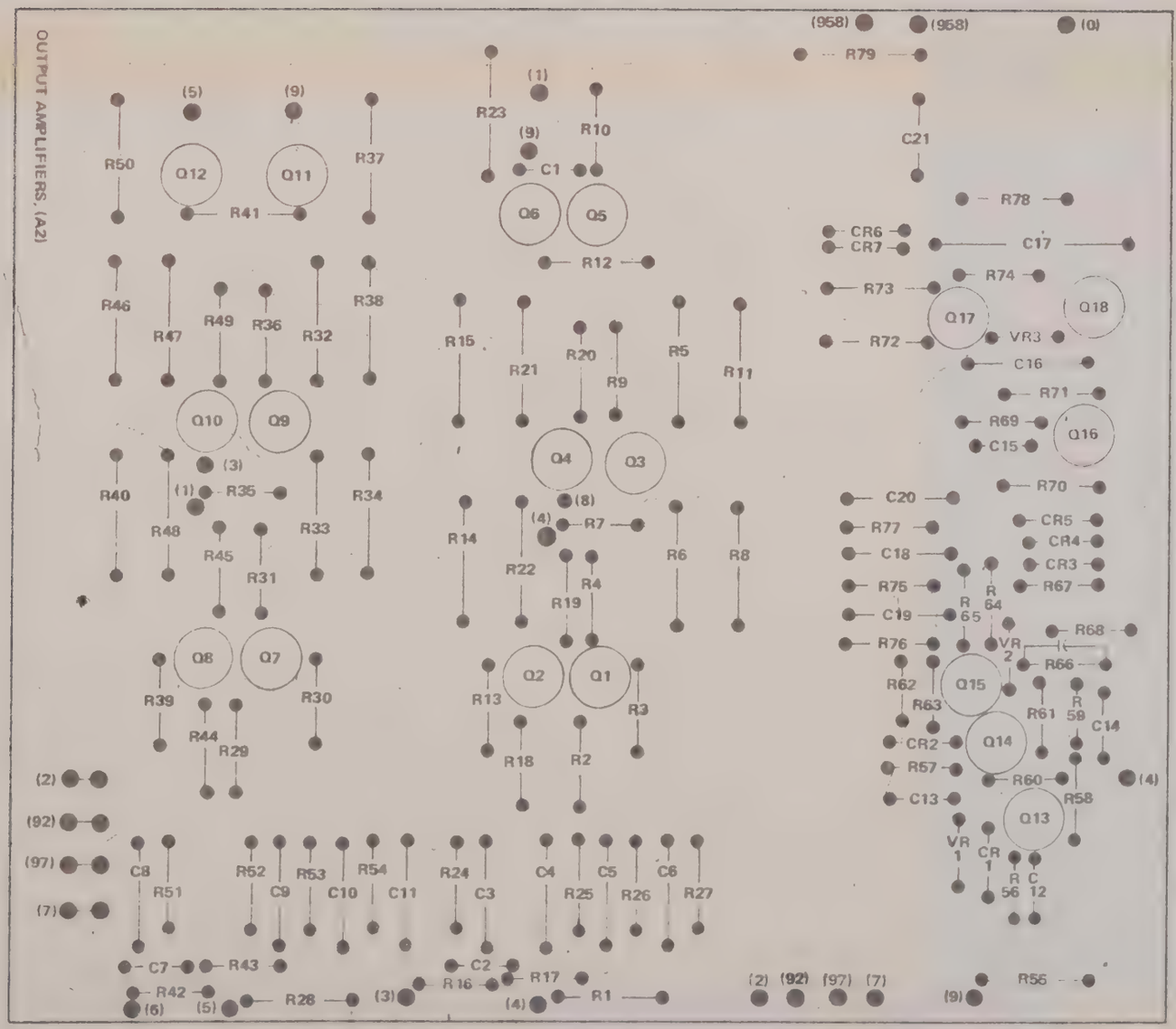

-99.9V
-14.6V
+14.6V
+99.9V
R37 6800
R32 7500
R33 2740
R36 33
TO CRT (+) RIGHT
R29 560
Q7
Q11
R28 470k
R31 33
Q9
R38 13k
R35 210
R34 8200
1
X-AXIS GAIN
CW
R35 500
R41 1470
-99.9V
R40 8200
R46 13k
3
R39 3300
R45 33
Q10
(92)
+15V
X-AXIS OFFSET
(97)
R31 50k
(92)
CW
-15V
(97)
R42 220k
R44 560
Q8
R49 33
Q12
R43 10k
C7 0.05
R47 7500
R48 2740
TO CRT (-) RIGHT
R50 6800
+14.6V
-14.6V
-99.9V
+99.9V
C8 0.027
R51 33
C9 0.02
R52 33
C10 .027
R53 33
C11 0.027
R54 33
X-AXIS AMPLIFIER
-100V
-15V
+15V
+100V

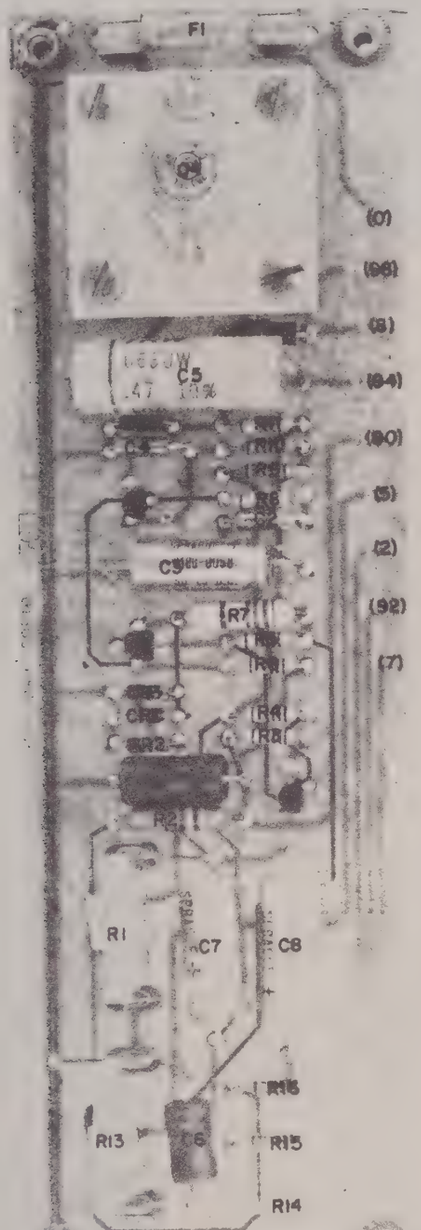


MODEL 13116-2

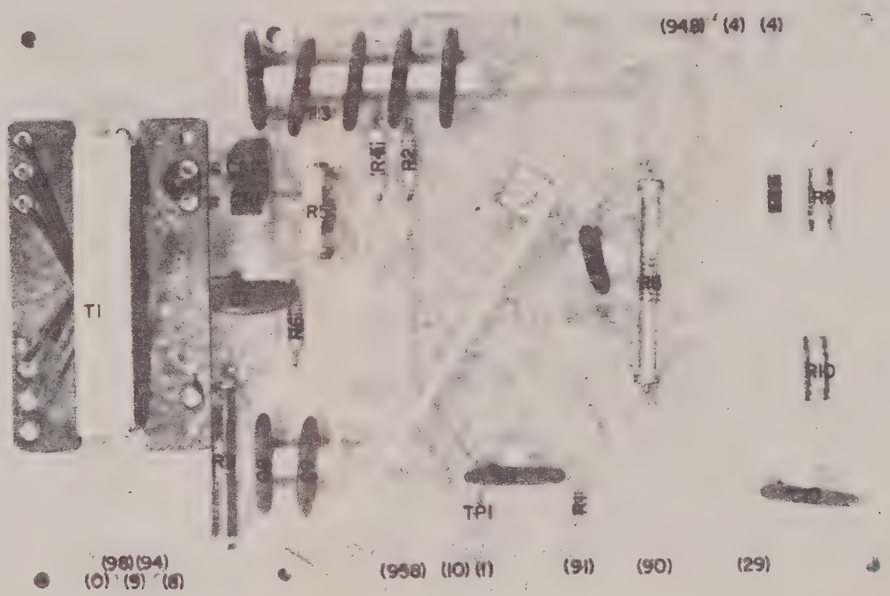
SCHEMATIC/COMPONENT LAYOUT

OUTPUT AMPLIFIERS, (A2)

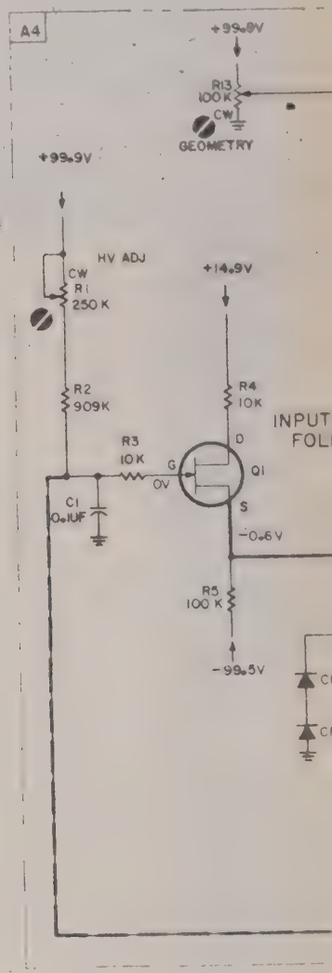

OUTPUT AMPLIFIERS. (A2)
(958)
(958)
(0)
R79
C21
R78
CR6
CR7
C17
R74
R73
Q17
Q18
R72
VR3
C16
R71
R69
Q16
C15
R70
C20
R77
CR5
CR4
C18
CR3
R75
R67
C19
R65
R64
R68
R76
VR2
R66
R62
Q15
R63
R61
R59
C14
CR2
Q14
R57
R60
(4)
C13
R58
Q13
VR1
CR1
R56
C12
(5)
(9)
R50
Q12
Q11
R37
R41
(1)
R23
(9)
R10
C1
Q6
Q5
R12
R46
R47
R49
R36
R32
R38
R15
R21
R20
R9
R5
R11
Q10
Q9
Q4
Q3
(3)
(8)
R40
(1)
R35
(4)
R7
R34
R14
R22
R4
R19
R6
R8
R48
R45
R31
R33
Q8
Q7
Q2
Q1
R39
R30
R13
R3
R44
R29
R18
R2
(2)
(92)
(97)
(7)
C8
R51
R52
C9
R53
C10
R54
C11
R24
C3
C4
R25
C5
R26
C6
R27
C7
R43
C2
R42
R16
R17
(6)
(5)
R28
(3)
(4)
R1
(2)
(92)
(97)
(7)
(9)
R56



HIGH VOLTAGE REGULATOR (A4)

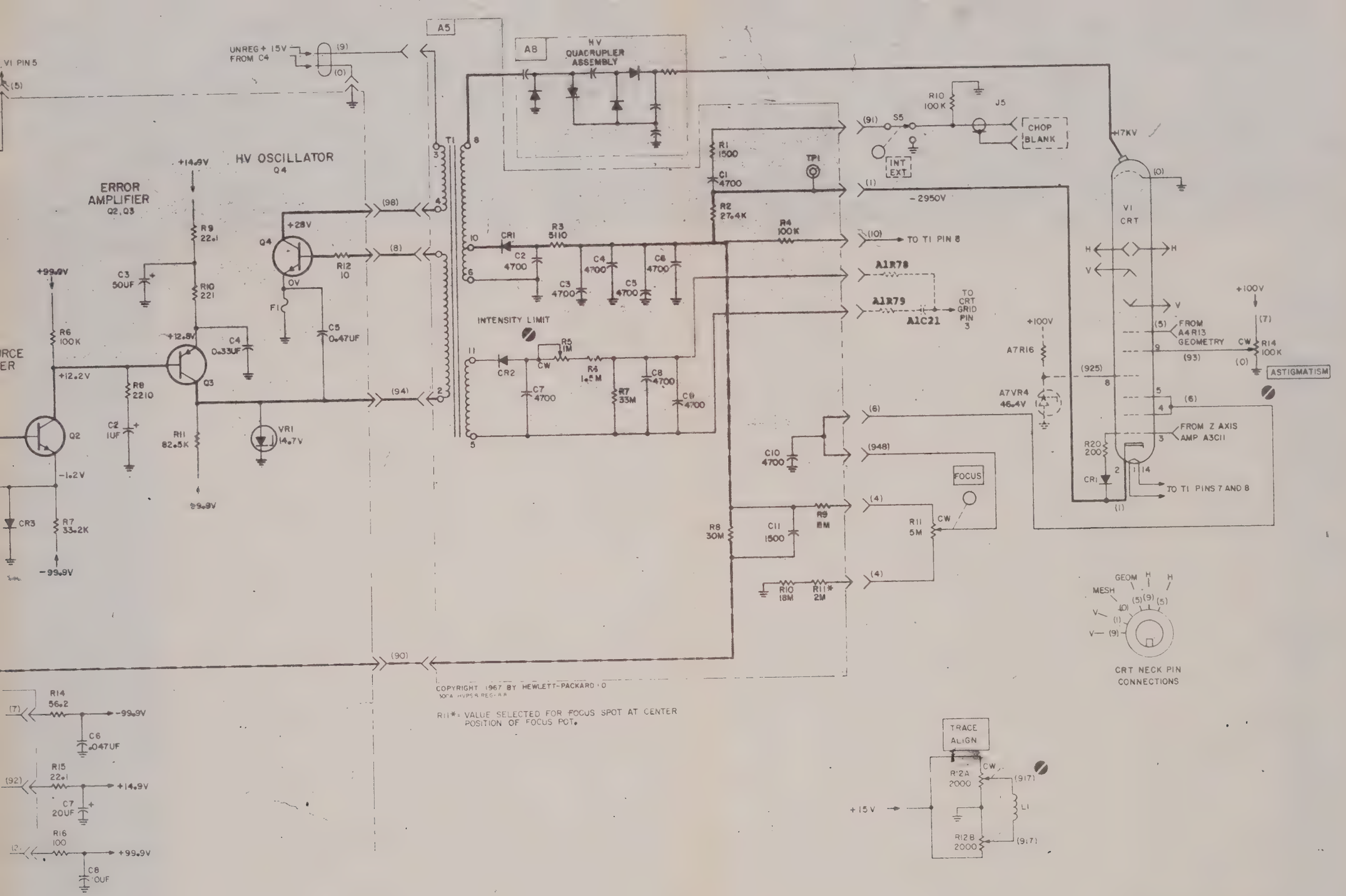


HIGH VOLTAGE RECTIFIER (A5)



REFERENCE DESIGNATIONS

A4	A5
C1-3	A
CR1-3	C
F1	CR1-2
Q1-4	R1-11
R1-16	T1
VR1	TP1
CHASSIS	
CR1	
J5	
L1-2	



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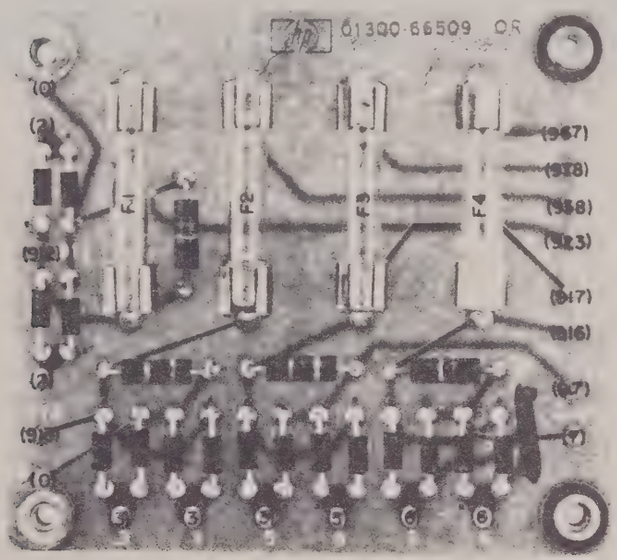
5004 HVPS/REG-AR

R11*= VALUE SELECTED FOR FOCUS SPOT AT CENTER POSITION OF FOCUS POT.

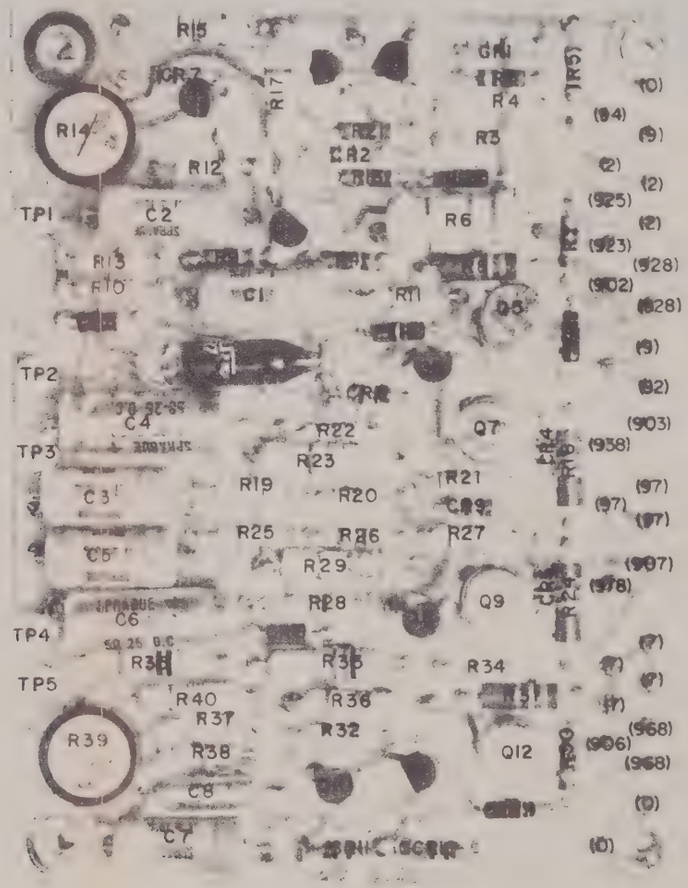
MODEL 13116-2

SCHEMATIC/COMPONENT LAYOUT
HIGH VOLTAGE POWER SUPPLY

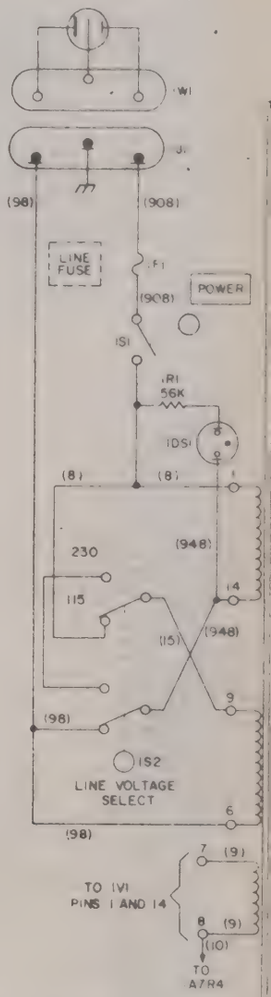
13921(A)



LOW VOLTAGE RECTIFIER (A6)



LOW VOLTAGE REGULATOR (A7)



REFERENCE DESIGNATIONS

		A6		A7	
C1-7	R 3	C	8	TP1-5	
DS1	S1,2	CR1-16		CR1-11	V1
F1	T1	F1-4		Q1-12	VR1-4
J1,6	W1	R1-4		R1-41	
Q1-4					

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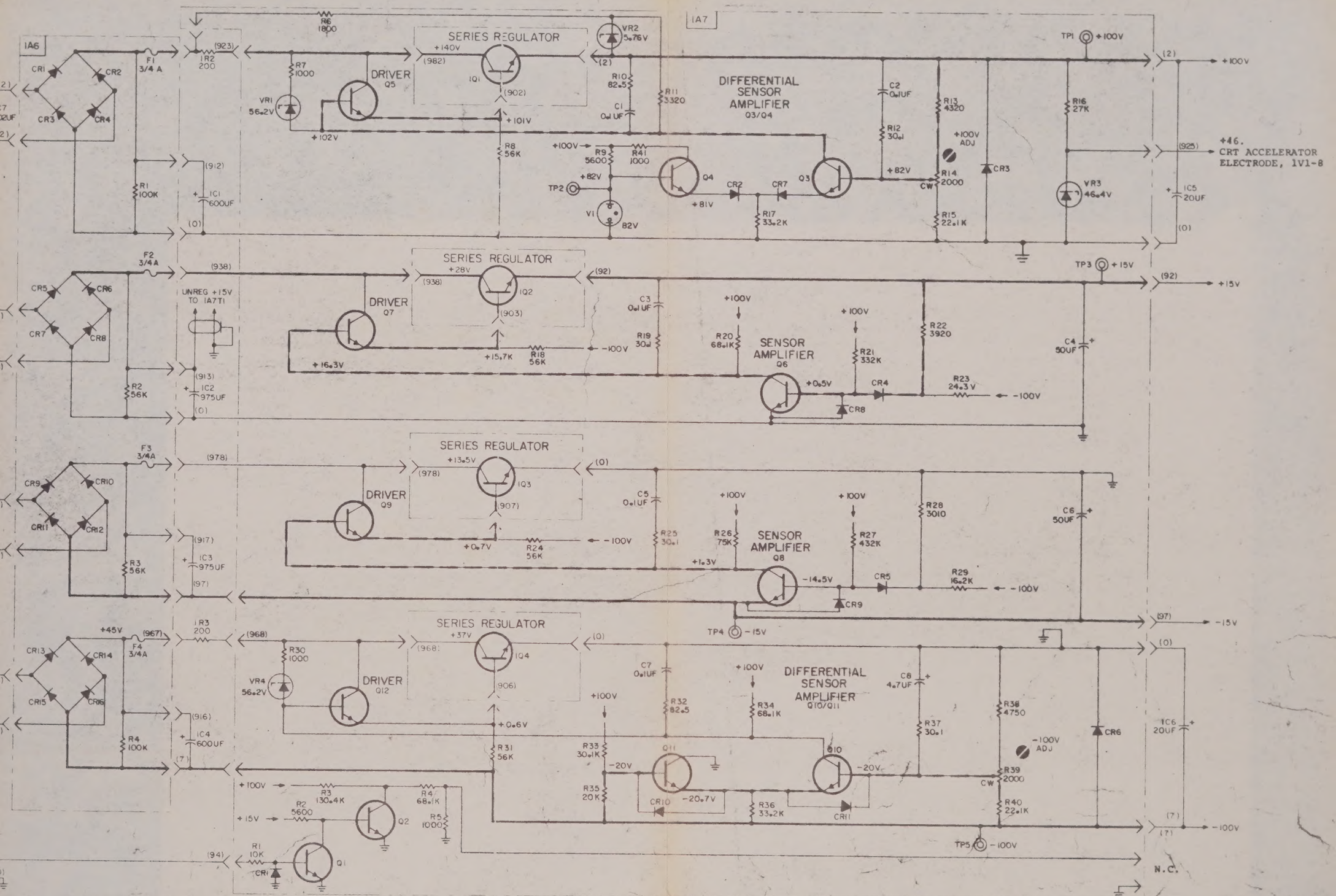
3004A-LVPS 8/8

Reference designations within assemblies shaded areas are abbreviated. Add assembly designation as prefix to form complete designation e.g. R1 on assembly A2 is A2R1



MODEL 13116-2

SCHEMATIC/COMPONENT LAYOUT
LOW VOLTAGE POWER SUPPLY

13922(A)